Chapter 10

Asians as Model Minorities: A Myth or Reality among Scientists and Engineers in Academia

Meghna Sabharwal

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/66827

Abstract

Asians from China, India, South Korea, and Taiwan constitute the largest non-White group in academic science and engineering (S&E). Most of the studies in relation to race/ethnicity combine Asians into one category whether they are immigrants (foreign born) or US citizens. Research has suggested that job satisfaction differs with the type of citizenship status held by faculty members. However, what studies fail to notice is that Asian faculty members who are either born in the United States or are naturalized might experience very different levels of attitudes and satisfaction toward their job when compared with Asian faculty members who are foreign born and on temporary visa status, impacting retention. Do institutions recognize the differences between these two groups, or are Asian faculty members considered a "model minority" group and "problem-free?" This is the question that this study aims to examine. Given the growing competition in S&E globally, matters pertaining to faculty members' satisfaction, retention, and persistence will take a front seat among policy makers and university administrators. Data for this study come from the National Science Foundation's Survey of Doctorate Recipients (SDR).

Keywords: Asian-non-US citizens, other non-US citizens, Asian-US citizens, other-US citizens, immigrant scientists, academic science and engineering, job satisfaction, job productivity, "model minority"

1. Introduction

Asians constitute the largest non-White group in academic Science and Engineering (S&E) in the United States (USA). According to recent S&E indicators report, in 2014, Asian faculty members, being born in the United States or foreign born, occupied close to 16% of full-time positions in US academic institutions, up from 4% in 1973. These people come from countries

such as Far East, Southeast Asia, or the Indian subcontinent, for example, Cambodia, China, India, Indonesia, Japan, Korea, Malaysia, Pakistan, the Philippines, Singapore, Taiwan, Thailand, and Vietnam. Note that the use of faculty does not imply an academic department or organizational unit rather refers to academic personnel (tenured and nontenured academic staff members) working at a university. These numbers are much higher in disciplines like computer sciences where over one-third (35%) of faculty members are of Asian origin [1]. According to the 2014 S&E Indicators report, "of the 46,000 US-trained Asian or Pacific Islander S&E doctorate holders employed in academia in 2010, 10% were native-born US citizens, 39% were naturalized US citizens, and 51% were noncitizens. In 2010, Asians or Pacific Islanders represented 52% of the foreign-born S&E faculty employed full-time in the United States [2].

Of the foreign-born faculty members, scholars of Chinese (22%) and Indian (15%) origin occupy more than a third of the full-time positions at 4-year colleges and universities in the United States [3]. Despite these statistics, there are no systematic studies examining the job satisfaction of Asian faculty members working in science and engineering departments in the United States. Most of the studies by race/ethnicity combine individuals of Asian descent into one category irrespective of their citizenship status Faculty members born in the United States or naturalized through the immigration process experience very different levels of satisfaction toward their job when compared with foreign-born faculty members on temporary status [3]. This study thus separates Asians by their citizenship status (i.e., Asian-non-US citizens and US citizens) and compares their satisfaction to other-noncitizens and other-US citizens. Data for this study comes from the 2003 Survey of Doctorate Recipients conducted by the National Science Foundation (NSF).

The academic sector in the United States is to a large extent dependent on the scientific contributions made by foreign-born scientists and engineers [4–6]. However, there is seldom a study exclusively focused on citizenship status and race. Even though many parallels can be drawn between the experiences of US-born Asians and foreign-born Asians, their achievements/barriers in the US labor market are likely to differ, mostly because immigrants from Asian countries arrive with different cultural, educational, and English language abilities. Retaining this group of scientists is important not only because they contribute to the scientific and technological growth of this country but also are a source of diversity [6]. The temporary nature of the citizenship among Asian scientists is concerning.

The governments of nations such as China, India, South Korea, and Taiwan who are the top exporters of talent to the United States are devising policies to attract thousands of their graduates back from the United States, creating newer economic opportunities for their returnees and the nation [7]. Traditionally, the United States has witnessed close to 85–95% stay rates among foreign-born scientists and engineers of Chinese and Indian origin; this number is on the decline, however. The percentage of India-born US-trained PhDs in science and engineering on temporary visa who continued to stay in the United States dropped from 85% in 2005 to 79% in 2009 [8]. The stay rates among Chinese born with identical visa status and educational training have dropped 4 percentage points during the 4-year period (93% in 2005 and 89% in 2009) [8]. There is evidence that between 1992 and 2003, more than eight thousand

http://dx.doi.org/10.5772/66827

foreign-trained scholars returned to mainland China on short visits funded by the Chinese government to lecture and engage in research collaborations [9]. Taiwan reported an 11% point decrease of stay rates from 2005 to 2009, while the highest drop is witnessed among South Korean scientists during the same time period (57% to 42%) [8]. Further, in 2008 of the 39,000 Asian/Pacific Islander PhDs employed in academia, 9% were native-born US citizens, 44% were naturalized US citizens, and 47% were non-US citizens [10]. Thus, Asian scientists on temporary visas (noncitizens) are the largest contributors to academic science and engineering.

The temporary nature of Asian scientists in S&E is thus an important aspect of the scientific enterprise of the United States. A recent article indicated that the Chinese government is providing research money and setting up labs for the returnees to continue their research. China recently launched the "Thousand Talents Programme" that aims at offering top scientists grants of 1 million yuan (about $146,000) along with generous lab funding [11]. India, on the other hand, has not moved as quickly as China, but the Department of Science and Technology recognizes that creating an environment that will facilitate the return of scientists and engineers of Indian origin is crucial in building and fostering collaborative ties with the international scientific world and meeting the human capital demands in higher education. Given the competition in science and technology with other nations and the efforts made by countries, such as South Korea, China, and, to some extent, India, to reclaim their highly skilled faculty members, matters of faculty satisfaction, retention, and persistence will take a front seat among policy makers and university administrators. Thus the purpose of this study is to analyze how Asian-non-US citizens and Asian-US citizens compare with other groups of members of S&E faculties in their satisfaction levels.

2. Asians as model minorities

Among the major racial/ethnic groups in the United States, Asian-Americans have the highest levels of education, income, and socioeconomic status [12]. While US citizens of Asian background have come a long way since the time early migrants came as slave laborers about 150 years ago. Asians are referred to as "model minorities." The term "model minority" was coined by higher academic achievement and socioeconomic status of current-day Asians when compared with African-Americans and Hispanics [13–16]. However, critics of this model argue that this group continues to confront inequities in income and upward job mobility when compared with their Caucasian counterparts [17–20]. Therefore the question arises: is "model minority" a reality or a myth?

The perception of "model minority" is attributed to factors such as college graduation rates, socioeconomic status, and higher representation in science and engineering disciplines [18]. The author also argues that Asian-Americans are more likely to graduate from college when compared with other minority groups (African-Americans and Hispanics). Further, they have family support that keeps them motivated to be successful and thus achieve higher paying jobs that translate into improved socioeconomic status. This group has the highest

representation in science and engineering disciplines as demonstrated by the success of the American immigration policy targeting high-skilled science and engineering professionals [21]. Given the high rates of representation of people of Asian descent in science and engineering, the National Science Foundation no longer includes this group as a minority since 1989. The minority categories in subsequent years include members of the following ethnic groups: Alaskan Native, Native American, African-American, and Hispanic. Thus, the "model minority" image reduces Asian-Americans as a racial group free of any challenges or racism—touted as the American success story [22].

Recent research has however criticized the "model minority" status glorified by several scholars [13–15, 23–25]. Studies show that this group faces challenges of income disparity and upward mobility in their jobs owing to their "outsider" perception [19, 20, 26]. A recent study shows that Asian-Americans have a 12% higher poverty rate than their white counterparts [27] despite the high median income reports [26].

3. Asian scientists and engineers: job satisfaction

This study will utilize data from the Survey of Doctorate Recipients, a national representative survey conducted by the National Science Foundation that understands the factors that contribute toward an individual's satisfaction/dissatisfaction with work. Work satisfaction improves the well-being of employees [28, 29] but more importantly increases the retention of faculty members [30, 31]. Several factors that impact an individual faculty member's job satisfaction are research productivity, faculty rank, tenure status, supervisory position, Carnegie classification of employer institution, discipline, salary, and sociodemographic factors [3, 32–37]. These will be examined for US citizen and noncitizen groups and compared to Asian-non-US citizen and Asian-US-citizen groups.

Studying satisfaction rates is important because faculties have high levels of job autonomy and they have the discretion to decide how they spend their time and resources. Dissatisfaction with any aspect of their job can result in lower productivity and quality of work [38]. A well-functioning faculty would not only impact the morale and quality of faculty members but also influence future faculty members and students. Past studies have shown various barriers faced by minority groups, impacting on their job satisfaction rates [39]. Foreign-borns of a faculty are likely to face challenges due to their citizenship status, cultural differences, the stereotypes they encounter, and varied levels of English language skills.

Lower satisfaction was reported among Asian and Middle Eastern faculty members in relation to job autonomy, decision-making authority, salary and benefits, job security, opportunities for career advancement, and outside consulting [40]. In another study, Asian-Indian individuals working in the academic and nonacademic sector in the United States (and a few who had returned to India) faced a glass ceiling at work, albeit they constitute a large proportion of the S&E workforce. Whites in S&E are ahead of Asian-Indian immigrants in management positions because of the cultural advantage they hold over Asians [41].

http://dx.doi.org/10.5772/66827

"The result is a promotion sequence that amounts to an uninterrupted, non-Hispanic White male succession, and a tendency to ignore structural conditions that create obstacles for Asian-Indian immigrants in the S&E workforce (p. 111)." [41]

One of the biggest reasons for Asian-American immigrants to be absent from upper management levels is due to the perceived lack of leadership qualities and poor English language skills. As one of the faculty members pointed out:

"Suppose you apply for a dean's position. You have good credentials and excellent English, but you also have an accent. I bet you will not be offered the job. The hiring committee will not see you as having language qualifications suited for the American system, though they will not say this openly (p. 103)." [41]

These factors can cause stress and lower one's level of job satisfaction. Asian-non-US-citizen scientists also experience lower satisfaction when spending greater amounts of time in teaching-related activities. A qualitative study of 20 engineering faculty members from China and India employed at a Research I University aimed at measuring their job satisfaction found that these individuals expressed greater frustration because of lack of recognition and concern with balancing teaching and research [42]. Other studies reported that Asian faculty members reported the least satisfaction among all ethnic groups. Despite the challenges faced by foreign-born faculty members, higher productivity rates were reported compared with native-born faculty members [3–6, 43–45].

4. Data and methodology

Data for this study comes from the 2003 Survey of Doctorate Recipients (SDR)[1] conducted by the National Science Foundation. This dataset was chosen because it has a large sample size and is highly recommended for data sampling. It has rich information on demographics, citizenship, nationality, educational background, employment, wages, scholarly activities, and job satisfaction. Such a large coverage reduces the risk of sampling error. In addition, the 2003 SDR data have information about the visa status of the doctoral recipients. This will help further break down the analyses of foreign-born faculty members based on visa status.

The survey was funded by the National Science Foundation and the National Institutes of Health. The actual survey was conducted by the National Opinion Research Center (NORC) at the University of Chicago. The data were collected from doctorate recipients with a degree from a US institution in the fields of science, engineering, or health sciences in June 2002. All the participants were under 76 years of age as of October 1, 2003, which was taken as the survey reference week. A total of 40,000 individuals with doctoral degrees were sampled in the 2003 survey.

[1]The 2003 SDR data were used since this is the only most current data that queries the respondents on various aspects of job satisfaction. Subsequent surveys only have one question on the overall job satisfaction. For more details visit http://www.nsf.gov/statistics/srvydoctoratework/.

The unit of analysis for this study is the individual academic scientist; hence, respondents with nonacademic jobs are filtered before beginning the analysis. For this filtering process, academics are counted as those faculty members working in a 4-year college or university during the reference week of October 2003. The data analysis is further limited to (1) full-time faculty employers and (2) faculty members employed in the real of science and engineering disciplines: biological, agricultural, and environmental life sciences; computer and information sciences; mathematics and statistics; physical sciences; and engineering. Individuals reporting psychology, social sciences, and health as the field of their first S&E degree were eliminated since the sample was very small for the Asian group to conduct any meaningful analyses. The original unweighted sample size was 29,915 and the weighted sample size was 685,296. The final sample resulted in 6375 (unweighted) and 141,625 (weighted) after following the various filtering stages outlined in this section. Data analysis is conducted by race/ethnicity and citizenship status. Information about race/ethnicity of individual's parents is not available. The respondents self-identify into a specific racial group.

It is important to mention that citizenship data is classified into four categories: US citizens, naturalized citizens, legal permanent residents (LPR), and temporary residents. Naturalized citizens are combined with US-born faculty members into one category (citizens), and LPR and temporary residents are classified as non-US citizens.

5. Results

5.1. Differences in job characteristics

Comparisons are made across four subgroups of faculty members: Asian-US citizens (10.7%), Asian-US noncitizens (4.2%), other-US citizens (80.4%), and other non-US citizens (4.7%). Other noncitizens are faculty members belonging to African-American, Hispanic, White, and other racial/ethnic groups born outside the United States. The majority of Asian-non-US citizens are from China (39.9%) followed by India (26.1%), Korea (8.2%), and Taiwan (6%). **Table 1** presents the mean differences between Asian-US citizens, Asian-non-US citizens and US citizens, and other-US-citizen groups. Across the four major groups, the highest number of female faculty members belongs to Asian-US citizens (32%), followed closely by other-non-US citizens (30%). Over 75% of all faculty members in all four groups are married. Asian-non-US citizens are the youngest group of faculty members with an average age of 39 years, while other-US citizens are the oldest with an average age of 49 years.

Majority of the faculty members among Asian-non-US citizens were employed at research I/II universities. A majority of Asian-US citizens received their highest degree in Biology (43.5%), similar to other-US-citizen groups (45%). Asian-non-US citizens have the highest percentage of faculty members with a degree in computer science (10%) and engineering (23%). These statistics are not surprising given that the majority of Asians come to the United States to get their doctoral degrees in these disciplines [1].

Interestingly, though the same percentage (56%) of faculty members belonging to both non-US-citizen groups (Asian and non-Asian) report working at a Research university,

http://dx.doi.org/10.5772/66827

	Asian-non-US citizens (N = 268, 4.2%)	Other-non-US citizens (N = 302, 4.7%)	Asian-US citizens (N = 680, 10.7%)	Other-US citizens (N = 5,125 80.4%)
Research productivity				
Average number of articles published between 1998 and 2003	8.12	9.48	9.90*	8.64
Average number of books published between 1998 and 2003	0.56	0.39	0.76	0.58
Average number of conference presentations between 1998 and 2003	11.10	12.02	12.22	11.25
Percent named as a patent inventor	15.0%	12.0%	18.0%**	13.0%
Percent granted a federal grant	57.0%	55.0%	60.0%	57.0%
Career trajectory				
Recognition—holding dean/department chair position	2.2%	3.0%	6.6%**	10.4%
Responsibility—supervising others	49.6%	49.0%	60.0%**	66.0%
Full professor	7.0%***	17.0%	34.0%**	39.0%
Associate professor	17.0%	17.0%	22.0%	24.0%
Assistant professor	46.0%	44.0%	24.0%+	21.0%
Instructor/lecturer	4.0%	6.0%	3.0%	3.0%
Other ranks	25.0%*	17.0%	17.0%**	12.0%
Tenure status				
Tenured	19.0%**	31.0%	50.0%**	55.0%
On tenure track but not tenured	37.0%	36.0%	19.0%	18.0%
Not on tenure track	17.0%	14.0%	13.0%*	10.0%
Tenure not applicable	27.0%*	18.0%	19.0%	17.0%
Job characteristics				
Research and development	62.0%**	51.0%	51.0%***	40.0%

	Asian-non-US citizens (N = 268, 4.2%)	Other-non-US citizens (N = 302, 4.7%)	Asian-US citizens (N = 680, 10.7%)	Other-US citizens (N = 5,125 80.4%)
Teaching	24.0%**	35.0%	29.0%***	40.0%
Institution type				
Research I/II universities	56.0%	56.0%	55.0%**	50.0%
Doctoral I/II university	12.0%	11.0%	10.0%	11.0%
Comprehensive I/II university	11.0%*	18.0%	14.0%**	19.0%
Liberal arts I/II university	2.0%	4.0%	4.0%***	8.0%
Others	19.0%*	12.0%	17.0%**	13.0%
Academic discipline				
Biology	37.7%**	26.0%	43.5%	45.0%
Mathematics and statistics	12.0%*	18.0%	9.0%	10.0%
Physical science	18.0%**	27.0%	20.0%**	25.0%
Computer and information sciences	10.0%	8.0%	7.0%***	3.0%
Engineering	23.0%	22.0%	21.0%**	17.0%
Salary	$62,922+	$66,778	$83,842	$81,870
Years of experience	7.09**	9.15	15.45***	17.73
Demographics				
Female	25.0%*	30.0%	32.0%***	24.0%
Married	81.0%+	74.0%	83.0%	82.0%
Age	39.4**	41.4	46.8***	48.7
Children living with parents	63.0%**	51.0%	55.0%**	50.0%

Note: *t*-Test comparisons across groups are statistically significant at various levels:
***$p < 0.001$,
**$p < 0.01$,
*$p < 0.05$, and
+$p < 0.1$.

Table 1. Mean differences in job characteristics.

Asian-non-US citizens far surpass the other groups in the time they report spending on research and development (62% vs. 51%), while the reverse is true for time spent teaching (24% vs. 35%).

On analyzing the rank of faculty members by citizenship and race, it is interesting to note that 7% of Asian-non-US citizens are full professors, while about 17% are full professors among

http://dx.doi.org/10.5772/66827

other-non-US-citizen groups. These differences are statistically significant between the two groups. One possible explanation for this disparity is that other-non-US-citizen faculty members have 2 years more experience than Asian-non-US citizens. However, Asian-US citizen and other-non-US-citizen groups have equal proportions of faculty members employed in associate professor positions (17%). As others have argued, this could also be a result of glass ceiling experienced by Asian faculty members while climbing the academic ladder [20, 46, 47]. The difference in tenure rates between these two groups of faculty members is important (19% Asian-non-US citizens and 31% other-non-US citizens) and statistically significant. Significant differences in tenure rates are also seen between Asian-US citizens and other-US citizens. Further investigation is required to determine whether Asian-non-US citizens are faced with barriers while trying to move up or whether they are experiencing lower promotion rates due to their temporary citizenship status. Similar patterns emerge when comparing Asian and other citizen groups, with fewer Asians-US citizens in leadership and full-professor positions.

5.2. Job satisfaction in relation to Asian descent and citizenship

Though Asians have been touted as "model minorities," the results of this study show otherwise. Despite being faced with career trajectories that are not on par with other-US-citizen/non-US-citizen groups, Asian-US citizens are the most productive. They produced the highest number of annual peer-reviewed journal articles, books, and conference papers. Asian-US citizens also are most likely to be named as inventors of a patent and awarded a federal grant when compared with the remaining three groups. Despite higher productivity, the average difference in salaries between Asian-US citizens and other-US citizens is not statistically significant.

Alongside comparing productivity and career trajectories, the aim of this study is to analyze the satisfaction of scientists and engineers by citizenship and race. The data in **Table 2** suggests that on average Asian-non-US citizens (3.20) and Asian-US citizens (3.38) express significantly lower overall satisfaction with their job than other-non-US-citizen (3.41) and US-citizen (3.46) groups.

Satisfaction is further analyzed as a measure of nine different factors: opportunities for advancement, benefits, intellectual challenge, degree of independence, location, level of responsibility, salary, job security, and contribution to society. On analyzing satisfaction by various factors, Asian-non-US citizens express the least average satisfaction on all factors but opportunities for advancement when compared with the three groups, other-non-US citizens (3.06), Asian-US citizens (2.99), and other-US citizens (3.04). Furthermore, Asian-non-US citizens and Asian-US citizens experience significantly lower levels of responsibility at work than other-non-US-citizen and US-citizen groups.

Dissatisfaction with level of responsibility is evident by the lower numbers of Asian-US citizens in dean/chair/full-professor positions when compared with other-US citizens. The results are in line with past research that focuses on the existence of the glass ceiling to upward career mobility experienced by Asians [20, 46, 47]. These studies question the portrayal of Asians in the US media as a "model minority." Instead, they argue that despite their achievements, Asians have not reached a level in which they participate in policy and decision-mak-

ing responsibilities [41]. Additionally, both groups of Asian faculty members (US citizens and non-US citizens) express significantly lower satisfaction with salary and benefits when compared with other-non-US-citizen and US-citizen groups.

Work satisfaction measures[a, b]	Asian-non-US citizens (N = 268, 4.2%)	Other-non-US citizens (N = 302, 4.7%)	Asian-US citizens (N = 680, 10.7%)	Other-US citizens (N = 5,125, 80.4%)
Overall job satisfaction	3.20***	3.41	3.38**	3.46
Opportunities for advancement	3.01	3.06	2.99	3.04
Benefits	3.08***	3.31	3.19*	3.26
Intellectual challenge	3.38*	3.53	3.53*	3.59
Degree of independence	3.54*	3.64	3.65*	3.70
Location	3.10***	3.34	3.36*	3.42
Level of responsibility	3.29**	3.45	3.40***	3.55
Salary	2.74***	2.97	2.88***	2.99
Job security	3.10+	3.22	3.35	3.40
Contribution to society	3.46	3.52	3.58	3.58

[a] Results are in response to the following statement: "Thinking about your principal job held during the week of October 1, 2003, please rate your satisfaction with that job's ….".

[b] Possible responses: 1 = very dissatisfied, 2 = somewhat dissatisfied, 3 = somewhat satisfied, and 4 = very satisfied

***$p < 0.001$.

**$p < 0.01$.

*$p < 0.05$.

+$p < 0.1$.

Table 2. Mean differences in job satisfaction by race and citizenship.

Asian-non-US citizens also express significantly less satisfaction with location when compared with other non-US citizens. The location of faculty members and its impact on their job satisfaction have not been studied in detail. The geographic location of faculty members is especially of importance when foreign-born faculty members are the subject of the study. The choice of location is generally limited among foreign-born faculty members, especially faculty members on nonimmigrant visa status. These groups of faculty members have fewer opportunities to find academic employment with visa sponsorship and are thus more likely to take up a tenure-track position irrespective of the location as compared with US citizens. Additionally, Asian-non-US citizens also express lower satisfaction with job security ($p < 0.1$) when compared with other-non-US citizens.

Job security is an important issue for non-US-citizen faculty members. Citizens of Indian and Chinese origin experience the longest delays in processing their permanent residency. An estimate suggests that there are over half a million skilled individuals waiting to get permanent residency in the United States [48]. Under the employment-based immigration category

http://dx.doi.org/10.5772/66827

(EB2), as of October 2016, applications filed in the year 2007 and later are being processed for immigrants from India [49]. The massive backlog in acquiring permanent residency is adding to the frustration faced by these groups of scientists. Challenges with acquiring a legal permanent residence (LPR) can serve as a deterrent for faculty members who would like to stay in the United States. The desire to acquire permanent residency along with existing pressures of being on a tenure-track position can result in lower satisfaction with job security and opportunities for advancement among Asian-non-US citizens. Other-non-US citizens do not face similar challenges with acquiring permanent residency and/or citizenship; the processing times are drastically shorter than Indian and Chinese immigrants [50].

5.3. Regression analysis of job satisfaction and productivity, career trajectory and job characteristics by citizenship status

To further explore the differences in satisfaction, four OLS regression models were run, and the results of which are presented in **Table 3**. The dependent variable is job satisfaction. Most of the studies use a global variable to measure faculty members' job satisfaction [34, 44, 51]. The questions are generally "yes" or "no" or are on a Likert scale with responses varying from "very satisfied" to "very dissatisfied." Single item measures of job satisfaction overestimate the percentage of satisfied vs. dissatisfied employees. On the other hand, multiple-item measures are better for estimating satisfaction levels [29]. This study thus uses nine questions that measure different aspects of work satisfaction to create the dependent variable job satisfaction. Participants used a 1-to-4 rating scale numbered from 1 (very satisfied) through 4 (very dissatisfied). Scores were subsequently reverse-coded with lower scores signifying lower levels of satisfaction and higher scores indicating more job satisfaction. The total job satisfaction scores range from 9 through 36 ($\alpha = 0.79$).

	Model 1 Asian-non-US citizens (N = 268, 4.2%)	**Model 2 other-non-US citizens (N = 302, 4.7%)**	**Model 3 Asian-US citizens (N = 680, 10.7%)**	**Model 4 other-US citizens (N = 5,125, 80.4%)**
Research productivity				
Annual number of articles published	0.063**	-0.014	0.134***	0.097***
Annual number of books published	0.284***	-0.362*	0.011	0.089*
Annual number of conference presentations	-0.030*	-2.874E-4	0.114***	0.059**
Percent named as a patent inventor	0.538***	0.828***	-1.198***	0.017
Percent granted a federal grant	0.865***	0.954***	0.146+	0.676***
Career trajectory				
Recognition—holding dean/department chair position	2.284***	2.892***	0.904***	0.597***
Full professor (reference group)				
Associate professor	1.211***	-0.476**	-0.570***	-0.685***

	Model 1 Asian-non-US citizens (N = 268, 4.2%)	Model 2 other-non-US citizens (N = 302, 4.7%)	Model 3 Asian-US citizens (N = 680, 10.7%)	Model 4 other-US citizens (N = 5,125, 80.4%)
Assistant professor	0.420**	-0.373	-0.524***	-1.520***
Instructor/lecturer	0.764**	0.651**	-1.582***	-0.824**
Tenure status—tenured (reference group)				
On tenure track but not tenured	1.005***	-0.576*	1.163***	1.127***
Not on tenure track	-0.808***	-2.804***	-2.406***	-1.258***
Tenure not applicable	0.472*	-3.551***	-1.205***	-1.011***
Years of experience	0.023*	-0.087***	0.051***	0.027***
Job characteristics				
Research and development (reference group)				
Teaching	-0.599***	0.482***	-0.975***	-0.345***
Institution type—research I/II universities (reference group)				
Doctoral I/II university	1.034***	-0.653***	-0.326**	0.622***
Comprehensive I/II university	1.250***	-1.796***	-0.483***	-0.850***
Liberal arts I/II university	-1.649***	-3.240***	-0.988***	0.925***
Others	-0.606***	-0.556***	-0.031	0.057
Discipline—biology (reference group)				
Mathematics and statistics	-1.713***	-0.532***	0.113	0.017
Physical science	-0.164	-0.49***	0.071	0.073
Computer and information sciences	0.720***	-0.104	0.282+	-0.177
Engineering	0.289*	-0.847***	-0.236*	-0.881***
Salary	2.583E-5***	2.751E-5***	6.000E-6***	1.069E-5***
Demographics				
Male	-0.234*	-0.309*	-0.088	-0.022
Married (reference group)				
Never married	0.906***	0.360*	-0.407**	-1.007***
Divorced and separated	1.005***	1.132***	0.354*	-0.640***
Children living with parents	-0.247*	-0.629***	-0.352***	0.191*
Pacific region	0.755***	1.450***	0.101	0.145
Linguistic distance	-1.918***	0.053	-3.190***	0.956**
Adjusted R square	0.218	0.247	0.216	0.167

Dependent variable: job satisfaction index
***$p < 0.001$.
**$p < 0.01$.
*$p < 0.05$.
+$p < 0.1$.

Table 3. Job satisfaction by race and citizenship.

The regression uses several sets of independent variables, which are classified into three major categories (a) research productivity, (b) career trajectory, and (c) job characteristics. Demographics are included as controls. Model 1 focused on Asian-non-US citizens and explained about 22% of variance in job satisfaction. Model 2, which included the other-non-US-citizen group,

http://dx.doi.org/10.5772/66827

explained 25% of the variance, the highest of all groups. Model 3 focused on Asian-US citizens and explained 21.6% of the variance in job satisfaction. Lastly, model 4 with faculty members belonging to non-Asian-US-citizen group explained the least variation in job satisfaction (16.7%).

5.3.1. Job satisfaction and research productivity

As seen in **Table 3**, the annual number of articles published has a positive and significant impact on the satisfaction of faculty members belonging to all groups, except other-non-US citizens. Interestingly, presentations made at conferences lowered the satisfaction of Asian-non-US citizens, a finding that was different for Asian-US citizens and other-US-citizen groups. Conference presentations, although an important part of scholarly life, can take time away from faculty members' work and time spent on research. Except Asian-US citizens, all other groups of faculty members experienced positive satisfaction when named as a patent inventor. All groups of scientists and engineers reported higher satisfaction when awarded a federal grant. Grant activity is an integral part of faculty members working in science and engineering disciplines. Being awarded a federal grant not only enhances the visibility of the individual scholar but also the department and ultimately the institution.

5.3.2. Job satisfaction and career trajectory and job characteristics

Furthermore, as seen in **Table 3**, Asian-non-US citizens in assistant, associate, and instructor/lecturer positions express higher levels of satisfaction than full professors. Contrary to popular literature [52], both groups of non-US-citizen faculty members in part-time (instructor/lecturer) positions express greater satisfaction with their jobs. Higher satisfaction is reported among part-time faculty members since these faculty members choose not to be on tenure-track positions and are content with their decision, possibly engaged in activities they enjoy the most—teaching and administration [53]. Full-professor position results in the greatest satisfaction among Asian-US citizens and other-US-citizen groups. All but other-non-US-citizen groups of scientists reported higher satisfaction with more experience.

For all groups, except other non-US citizens, greater time spent on teaching-related activities resulted in lower job satisfaction. As faculty members spend more time on teaching, it takes time away from research, thus lowering their job satisfaction. The results confirm past findings [37, 54]. Asian-non-US citizens, employed at doctoral and comprehensive[2] universities, express greater satisfaction that those at research universities. Faculty members not working in research universities might experience a greater balance between research and teaching, thus leading to higher job satisfaction [55, 56]. However, faculty members across all

[2]For a detailed classification of the new Carnegie codes, refer to the website: http://carnegieclassifications.iu.edu/classification_descriptions/basic.php.
The 2006 classification includes (1) Doctoral Granting Universities that further are classified into RU/VH, Research Universities (very high research activity); RU/H, Research Universities (high research activity); and DRU, Doctoral/Research Universities. (2) Master's Colleges and Universities: Master's/L, Master's Colleges and Universities (larger programs); Master's/M, Master's Colleges and Universities (medium programs); and Master's/S, Master's Colleges and Universities (smaller programs). (3) Baccalaureate Colleges: Bac/A&S, Baccalaureate Colleges, Arts and Sciences; Bac/Diverse, Baccalaureate Colleges, Diverse Fields; and Bac/Assoc, Baccalaureate/Associate's Colleges. (4) Associate's Colleges have 14 different subclassifications of all colleges offering two-year degrees. (5) Special Focus Institutions. (6) Tribal colleges.

four groups employed at liberal arts colleges[3], where teaching is greatly emphasized, reported lower job satisfaction than faculty members in research universities.

Asian-non-US citizens employed in engineering and computer science disciplines experience greater satisfaction than faculty members employed in biology. The results are in stark contrast to other-US-citizen and non-US-citizen groups. The findings are interesting and suggest that satisfaction is in part a measure of similar groups working together. Given that one-third of Asian-non-US citizens are employed in these disciplines (computer science and engineering), scientists belonging to this group might experience a sense of belongingness, which serves as an intrinsic motivator, further enhancing satisfaction at work [57].

5.3.3. Job satisfaction and demographics

Male faculty members are significantly less satisfied than female faculty members in both noncitizen groups (Asian-non-US-citizen and other-non-US-citizen groups) (see **Table 3**). The findings of this study differ from several studies that have indicated female faculty members in S&E intend to quit as a result of lower job satisfaction [32, 33, 37, 38, 58, 59]. Past studies also indicate that male faculty members derive greater satisfaction from the amount of financial support they receive for their research in comparison with female faculty members who get satisfaction from peer support. Although this study does not report satisfaction with various aspects of work by gender, the findings in the literature are interesting, suggesting that women seek supportive work environments leading to higher intrinsic satisfaction [28].

Marriage lowered the job satisfaction among Asian and other non-US-citizen groups when compared with citizen groups. Although several studies have shown the positive impact of marriage on job satisfaction, a few have suggested that marriage can negatively impact satisfaction. This is especially true in the case of female faculty members who are constantly faced by the challenges of balancing career and family. Women married with children are often forced into juggling two separate lives, hence putting them at a disadvantage in their professional careers [60, 61]. However, scientists belonging to citizen groups (Asian and non-Asian), who are unmarried, report lower satisfaction than their married counterparts. One possible explanation for opposite findings for US-citizen and non-US-citizen groups is that marriage is related to the age of faculty members [62]. Asian-non-US citizens and other-noncitizen scientists are typically younger and on tenure-track positions but not tenured. The demands to achieve tenure along with family responsibilities might result in lower job satisfaction among married non-US-citizen groups of scientists. However, the opposite is true for US-citizen groups.

Asian-non-US-citizen and other-non-US-citizen faculty members employed in the Pacific region of the United States report higher job satisfaction. Location did not impact the satisfaction of Asian-US-citizen and other-US-citizen groups. The Pacific region, according to the 2000 Census Bureau[4], is the most ethnically diverse region in the country, with less than 60%

[3]Liberal arts: These institutions are primarily undergraduate colleges with major emphasis on baccalaureate programs. For more information, see http://carnegieclassifications.iu.edu/downloads/2000_edition_data_printable.pdf.
[4]See US Census for more details: http://www.census.gov/quickfacts/table/PST045215/06,00.

http://dx.doi.org/10.5772/66827

of the population being White alone. This confirms the results from previous studies, which suggest that minorities employed in ethnically diverse regions are likely to express greater job satisfaction as compared with faculty members employed in less diverse parts of the country [44, 51]. Further, Asian-non-US citizen and Asian-US citizens with lower English language skills report negative job satisfaction, a finding that supports previous work by [63].

6. Conclusion

This study compared the job satisfaction of four groups of scientists employed at research universities in the United States. With high proportion of S&E Asian immigrant faculty members (US citizens and non-US citizens) employed in the American academy, the study focused on comparing the job satisfaction of Asian-non-US-citizens to other non-US-citizen groups and Asian-US citizens to other-US citizens. Comparing the career trajectories, research productivity, and job satisfaction of these groups helped debunk the "model minority" myth. While Asian-US citizens can be considered a "model minority" when comparing research productivity with all groups of scientists, they are far from being problem-free and without encountering challenges. Both Asian groups (US citizens and non-US citizens) express lower degrees of overall job satisfaction, benefits, level of responsibility, salary, intellectual challenge, and degree of independence than other-US-citizen and non-US-citizen faculty members. Though Asian-US citizens are the most productive, they are less likely to be in leadership roles, a finding that requires further investigation. Further, the lower job satisfaction reported among Asian-non-US citizens is concerning given that satisfaction impacts retention rates [30, 31, 64]. These faculty members play an important role in the scientific, technological, and economic growth of the United States.

According to [8], the percentage of doctorate recipients from Asian countries such as China, India and South Korea, and Taiwan are on temporary visas but have hopes and plans to stay in the United States. Their numbers have decreased to an average of 9 percentage points between 2005 and 2009 for those with definite plans to stay in the United States [8]. Losing them in the form of reverse migration can add to the challenges faced by the scientific enterprise in the United States. The cost of replacing these faculty members could be enormous considering that institutions at a typical research university invest anywhere from $300,000 to $500,000 in start-up costs for an assistant professor and well over a million dollars to attract and retain senior faculty members [65]. The results of this research might aid university administrators to rethink their diversity programs. In addition to increasing the numbers of Asian prospective doctorates, there is a need to understand their behavior, their level of uncertainty and attitudes, as well as the difference of satisfaction when looking at those who are US citizens and are of Asian descent (race). This study is a step in that direction.

We argue that further research between US scientists and Asian-non-US-citizen scientists would be helpful in determining the importance of this group. Current data lacks variables on collaboration, environmental factors such as collegial relationships, work environment, and peer and student interactions, which impact faculty members' job satisfaction [34]. Future studies should include these variables for a better comprehension of the issues. Additionally, official

statistics should determine Asian faculty members by their country of origin. This would provide a further understanding of the career trajectories and satisfaction of this important group and perhaps clarify the myth of the "model minority," something we attempted to do.

Author details

Meghna Sabharwal

Address all correspondence to: meghna.sabharwal@utdallas.edu

School of Economic, Political and Policy Sciences, The University of Texas at Dallas, Richardson, TX, USA

References

[1] National Science Board. Science and Engineering Indicators. 2010. Arlington, VA: National Science Foundation (NSB 10-01).

[2] National Science Board. Science and Engineering Indicators. 2014. Arlington, VA: National Science Foundation (NSB 14-01).

[3] Sabharwal M. Job satisfaction patterns of scientists and engineers by status of birth. Research Policy. 2011;40(6):853–863.

[4] Corley EA, Sabharwal M. Foreign-born academic scientists and engineers: producing more and getting less than their US-born peers?. Research in Higher Education. 2007;48(8):909–940.

[5] Levin SG, Stephan PE. Are the foreign born a source of strength for US science?. Science. 1999;285(5431):1213–1214.

[6] Sabharwal M. High-skilled immigrants: how satisfied are foreign-born scientists and engineers employed at American universities?. Review of Public Personnel Administration. 2011;31(2):143–170.

[7] Saxenian A. Transnational communities and the evolution of global production networks: the cases of Taiwan, China and India. Industry and Innovation. 2002;9(3):183–202.

[8] Finn MG. Stay Rates of Foreign Doctorate Recipients from US Universities, 2009. 2012. USA: Oak Ridge Institute for Science and Education.

[9] Zweig, D. 2005. Learning to compete: China's efforts to encourage a "reverse brain drain". In C. Kuptsch and E. F. Pang (Eds.), Competing for Global Talent, p.187–214. Geneva: ILO International Institute for Labour Studies.

[10] Science and Engineering Indicators. 2012. Available at://www.nsf.gov/statistics/seind12/pdf/overview.pdf, June 11, 2014.

[11] Engardio P. China's reverse brain drain. Bloomberg Businessweek. 2009. 19 November.

[12] Wong F, Halgin R. The "model minority": bane or blessing for Asian Americans?. Journal of Multicultural Counseling and Development. 2006;34(1):38.

[13] Cheng C. Are Asian American employees a model minority or just a minority?. Journal of Applied Behavior Science. 1997;33(3):277–290.

[14] Hoy RR. A 'model minority' speaks out on cultural shyness. Science. 1993;262(5136): 1117–1118.

[15] Kao G. Asian Americans as model minorities? A look at their academic performance. American Journal of Education. 1995;103(2):121–159.

[16] Suzuki BH. Asian Americans as the "model minority": outdoing whites? or media hype?. Change: The Magazine of Higher Learning. 1989;21(6):13–19.

[17] Bell MP, Harrison DA, McLaughlin ME. Asian American attitudes toward affirmative action in employment implications for the model minority myth. Journal of Applied Behavior Science. 1997;33(3):356–377.

[18] Suzuki BH. Revisiting the model minority stereotype: implications for student affairs practice and higher education. New Directions for Student Services. 2002;2002(97):21–32.

[19] Wong P, Lai CF, Nagasawa R, Lin T. Asian Americans as a model minority: self-perceptions and perceptions by other racial groups. Sociological Perspectives. 1998;41(1):95–118.

[20] Woo D. Glass Ceilings and Asian Americans: The New Face of Workplace Barriers. 2000. Walnut Creek, CA: AltaMira Press.

[21] Mallick J. H-B1 Visas. In EW Chen and Y. J. Grace (EDs), Encyclopedia of Asian American Issues Today, p.117–122. 2010. Santa Barbara: CA: ABC-CLIO.

[22] Chou RS, Feagin JR. Myth of the Model Minority: Asian Americans Facing Racism. 2015. Boulder, CO: Paradigm Press.

[23] Waters MC, Eschbach K. Immigration and ethnic and racial inequality in the United States. Annual Review of Sociology. 1995;21:419–446.

[24] Xie Y, Goyette KA. A Demographic Portrait of Asian Americans. 2004. New York: Russell Sage Foundation.

[25] Zeng Z, Xie Y. Asian-Americans' earnings disadvantage reexamined: the role of place of education. American Journal of Sociology. 2004;109(5):1075–1108.

[26] Kim N. Asian Americans' experiences of "race" and racism. In Handbooks of the Sociology of Racial and Ethnic Relations. 2007. US: Springer; pp. 131–144.

[27] Sakamoto A, Goyette KA, Kim CH. Socioeconomic attainments of Asian Americans. Annual Review of Sociology. 2009;35:255–276.

[28] Gruneberg MM. Understanding Job Satisfaction. 1979. New York, NY: Wiley Press

[29] Oshagbemi T. Job satisfaction profiles of university teachers. Journal of Managerial Psychology. 1997;12(1):27–39.

[30] Johnsrud L, Heck R. A university's faculty: predicting those who will stay and those who leave. Journal for Higher Education Management. 1994;10(1):71–84.

[31] Rausch DK. The academic revolving door: why do women get caught?. CUPA Journal. 1989;40(1):1–16.

[32] Bilimoria D, Perry SR, Liang X, Stoller EP, Higgins P, Taylor C. How do female and male faculty members construct job satisfaction? The roles of perceived institutional leadership and mentoring and their mediating processes. The Journal of Technology Transfer. 2006;31(3):355–365.

[33] Callister RR. The impact of gender and department climate on job satisfaction and intentions to quit for faculty in science and engineering fields. The Journal of Technology Transfer. 2006;31(3):367–375.

[34] Hagedorn LS. Conceptualizing faculty job satisfaction: components, theories, and outcomes. New Directions for Institutional Research. 2000;2000(105):5–20.

[35] Laden BV, Hagedorn LS. Job satisfaction among faculty of color in academe: individual survivors or institutional transformers?. New Directions for Institutional Research. 2000;2000(105):57–66.

[36] Okpara JO, Squillace M, Erondu EA. Gender differences and job satisfaction: a study of university teachers in the United States. Women in Management Review. 2005;20(3):177–190.

[37] Olsen D, Maple SA, Stage FK. Women and minority faculty job satisfaction: professional role interests, professional satisfactions, and institutional fit. The Journal of Higher Education. 1995;267–293.

[38] Tack, MW, Patitu, CL. Faculty job satisfaction: Women and minorities in peril. 1992. (ASHE-ERIC Higher Education Report No. 4). Washington DC: The George Washington University, School of Education and Human Development.

[39] Antonio A, Cress C, Astin A. Faculty diversity: faculty of color still low in numbers and ranking; But Latino/as report high job satisfaction. The Hispanic Outlook in Higher Education. 1997;7(26):14.

[40] Wells R, Seifert T, Park S, Reed E, Umbach P. Job satisfaction of international faculty in US higher education. Journal of the Professoriate. 2007;2(1):5–32.

[41] Varma R. Harbingers of Global Change: India's Techno-immigrants in the United States. 2006. Lexington Books.

[42] Madhavan SM. The Job Satisfaction Level of Chinese-and Indian-Born Engineering Faculty at a Research I University. 2001. West Virginia University, ProQuest Dissertations Publishing.

[43] Lee S. Foreign-Born Scientists in the United States–Do They Perform Differently Than Native-Born Scientists?. 2004. Ph.D Dissertation, Georgia Institute of Technology, Atlanta, GA.

[44] Liu M. The Adaptation and Experience of Foreign-Born Faculty Members in the United States. 2001. The Claremont Graduate University, ProQuest Dissertations Publishing.

[45] Stephan PE, Levin SG. Exceptional contributions to US science by the foreign-born and foreign-educated. Population Research and Policy Review. 2001;20(1–2):59–79.

[46] Tang J.. Doing Engineering: the Career Attainment and Mobility of Caucasian, Black, and Asian-American Engineers. 2000. Rowman & Littlefield.

[47] Wu DTL. Asian Pacific Americans in the Workplace. 1997. Walnut Creek, CA: AltaMira Press.

[48] Wadhwa V. A Reverse Brain Drain. Issues in Science and Technology. 2009; 25(3).

[49] Visa Bulletin. Visa Bulletin for October 2016. 2016. Available at: https://travel.state.gov/content/visas/en/law-and-policy/bulletin/2017/visa-bulletin-for-october-2016.html.

[50] Wadhwa V, Salkever A. The Immigrant Exodus: why America Is Losing the Global Race to Capture Entrepreneurial Talent. 2012. Wharton Digital Press.

[51] Gupta D. The Careers and Return Migration of Foreign-Born United States PhDs. 2004. ProQuest Digital Dissertations. (AAT 3165392)

[52] Bender KA, Heywood JS. Job satisfaction of the highly educated: the role of gender, academic tenure, and earnings. Scottish Journal of Political Economy. 2006;53(2):253–279.

[53] Valadez JR, Anthony JS. Job satisfaction and commitment of 2 year college part-time faculty. Community College Journal of Research & Practice. 2001;25(2):97–108.

[54] Marsh HW, Hattie J. The relation between research productivity and teaching effectiveness: complementary, antagonistic, or independent constructs?. The Journal of Higher Education. 2002;73(5):603–641.

[55] Hermanowicz JC. Scientists and satisfaction. Social Studies of Science. 2003;33(1):45–73.

[56] Holden C. Long hours aside, respondents say jobs offer 'as much fun as you can have'. Science. 2004;304(5678):1830.

[57] Herzberg F, Mausner B, Snyderman B. The Motivation to Work. 1959. New York, NY: Wiley Press.

[58] Settles IH, Cortina LM, Malley J, Stewart AJ. The climate for women in academic science: the good, the bad, and the changeable. Psychology of Women Quarterly. 2006;30(1):47–58.

[59] Hult C, Callister R, Sullivan K. Is there a global warming toward women in academia?. Liberal Education. 2005;91(3):50–57.

[60] Aisenberg N & Harrington M. Women of Academe: Outsiders in the Sacred Grove. 1988. Amherst: University of Massachusetts Press.

[61] Gappa JM, Leslie DW. The Invisible Faculty. Improving the Status of Part-Timers in Higher Education. 1993. ERIC. San Francisco, CA: Jossey-Bass.

[62] Leung T, Siu O, Spector PE. Faculty stressors, job satisfaction, and psychological distress among university teachers in Hong Kong: the role of locus of control. International Journal of Stress Management. 2000;7(2):121–138.

[63] Chiswick BR, Miller PW. The endogeneity between language and earnings: international analyses. Journal of Labor Economics. 1995;13:246–288.

[64] Waldorf B. Determinants of international return migration intentions. The Professional Geographer. 1995;47(2):125–136.

[65] Ehrenberg RG. Key Issues Currently Facing American Higher Education. 2004. CHERI Working Paper #46. Retrieved from Cornell University, ILR School site: http://digitalcommons.ilr.cornell.edu/workingpapers/45/